

START OF THE MORSE TELEGRAPHY IN JAPAN

AND MORSECODE IN JAPANESE

PART 1: A BIT OF HISTORY

Introduction

While telecommunication technology quickly evolved in Europe and the United States of America, the ‘*shogunate*’ (the ‘Shōgun’ was the military dictator of Japan during the period from 1185 to 1868) government of Japan continued the National Isolation Policy until 1858, which strictly limited the import of scientific knowledge and technologies from Western countries. Consequently, telecommunication technology was unknown in Japan before the 1850s. However, some early Japanese engineers quickly mastered the technology during the 1850s despite their limited understanding of electricity and electromagnetics.

This chapter is based upon a paper by Prof. Ohta's [1]. It explores how these engineers caught up with the advancements made by Western countries in telecommunication technology in the 1850s.

Historical background

The *National Isolation Policy* strictly prohibited exchanges with foreign countries, Christian countries in particular. An exception to this was the Netherlands. The government considered the Netherlands to be the only Christian country that would not attempt to overthrow their government. Consequently, the Netherlands was the only country permitted to engage in trade with Japan. This meant that the advanced science and technologies of Western countries was imported to Japan exclusively by the Netherlands. Thus, for scientists and engineers, the Dutch language and the books imported from the Netherlands were particularly significant.

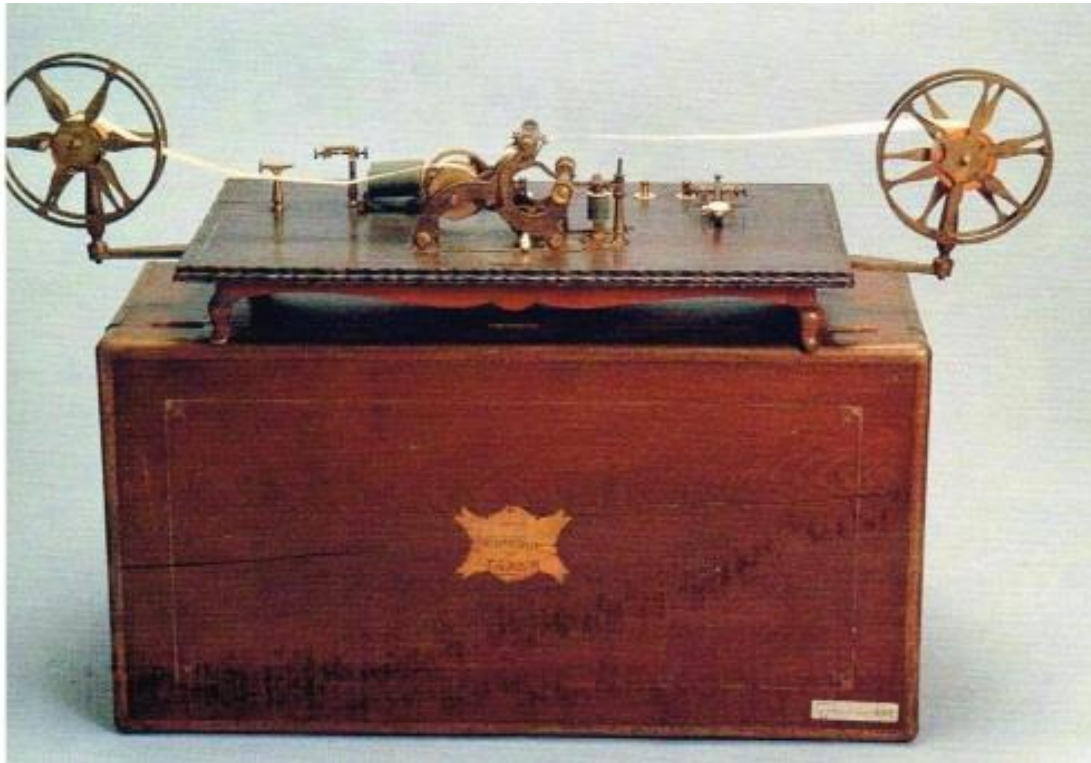
However, even the Dutch could not do as they pleased in Japan. The area in which they could conduct activities was limited to a very narrow district called Dejima, which is an island in Nagasaki. Thus, every import from the Netherlands, including Western science and technologies, went through Dejima before reaching the other areas of Japan. Therefore, Dejima is often mentioned in the early history of the Japanese telegraph.

First arrival of the (Dutch) telegraph

The telegraph first arrived in Japan around 1853. At that time, the head of the Dutch factory in Dejima, Jan Hendrik Donker Curtius, invited a medical officer J. K. van den Broek to Dejima. Since Broek had mastered medicine, pharmacy, chemistry, mathematics, physics, and engineering, he was charged with the expectation of spreading science and technologies throughout Japan. To fulfill this expectation, he brought experimental instruments to Dejima, including a telegraph. This was the first telegraph imported into Japan. Broek set up the telegraph in the Dutch factory in Dejima. Witness records state that his apparatus was a dial (ABC) type telegraph. He explained the mechanism and operation of the apparatus to a Japanese medical doctor named Keisai Yoshio. Yoshio should therefore be remembered as the first telecommunication engineer in Japan. Unfortunately, since only a limited number of people had an opportunity to see the apparatus, the technology did not spread widely. However, things changed when important events occurred over the next few years.

Demonstration of a telegraph by the United States

In the middle of the 19th century, the United States of America was planning to force its way into the trade monopoly between the Netherlands and Japan. To execute their plan, they sent a delegation led by Commodore Matthew C. Perry. The delegation visited Japan in 1853 and 1854, and arrived on cutting-edge steam-engine warships. They insisted on beginning imports from the United States with using their superior military power. During their second visit in 1854, they succeeded in signing a trading treaty with Japan. During their second visit, the delegation also brought a lot of presents for the shogunate government. The purpose behind giving these presents was to provide product samples of the United States as well as to show their advances in science and technologies. The presents included agricultural equipment, guns, liquor, a model of a steam locomotive, and a telegraph.



The Morse telegraph offered by Commandant Perry in 1854
Image of the Postal Museum Japan

The apparatus offered in 1854 to the government was a Morse telegraph, which was made by John Norton and C. T. Chester. This apparatus printed Morse code signals by embossing paper tape.

It is about the same as my U.S. Tillotson one here on the right.

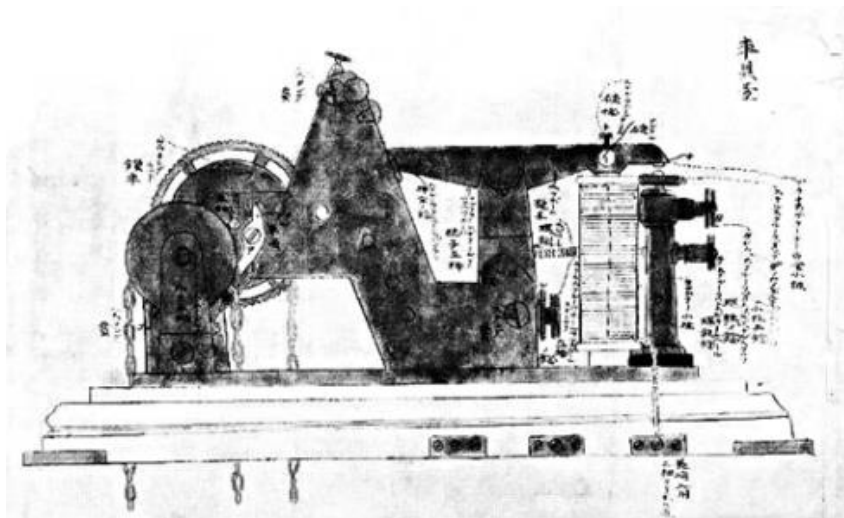
This was the first telegraph demonstration that was witnessed by a lot of people, including officers from the central and domestic governments. The demonstration convinced some members of the government about the significance of telecommunication technology. In the demonstration, sequences of alphabets were created by writing the pronunciation of a Japanese word, encoding it by the Morse code, and then transmitting it. The government dismantled it for analysis. Unfortunately, owing to their total lack of knowledge about electricity and electromagnetism, they failed to reassemble the dismantled apparatus. Thus, the telegraph offered by the United States could never be operated again.





Telegraph offered by the Dutch and its demonstration by the Japanese

Nearly four months after the demonstration by the United States, the Netherlands also presented a Morse embossing telegraph to the shogunate government. Compared with the telegraph offered by the United States, this Dutch present is more significant in spreading the technology in Japan because the Dutch provided the hardware as well as manuals, comprehensive textbooks, training by a Dutch tutor, and even the very first Morse code for Japanese Katakana characters (see PART 2). Owing to these detailed documents and training, Japanese officers were able to master the operation of the Dutch telegraph. Consequently, the Dutch telegraph was successfully demonstrated for the Shogun and other important officers by Japanese trainees in 1855. This was the first telegraph demonstration performed by the Japanese.



A handwritten copy of a figure in the textbook provided by the Netherlands. Source: T. Kikuch (Ed.),

The original copy of these documents was lost. However, the translated versions have survived. A few months after the offering of the telegraph by the Dutch, training began in Dejima. The trainer was again J. K. van den Broek. This model is identical to the first morse telegraph made by Siemens & Halske in 1851 (see here below the model in my collection). It is for sure that the Dutch Administration did not make such telegraphs (their first model!) but ordered them from the German company.



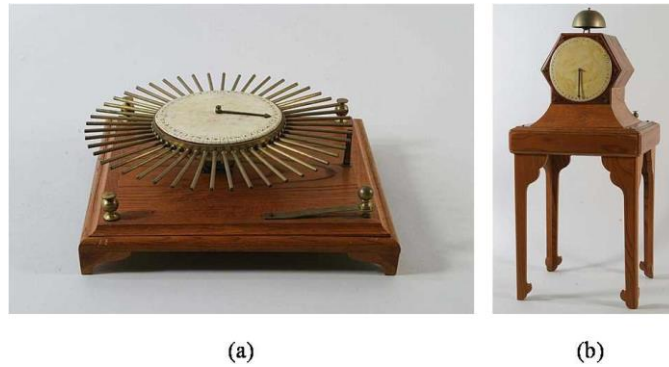
My similar Siemens & Halske model of 1851

Prussia's gift

In 1860, Prussia sent a delegation to Japan. They also carried a telegraph as a gift to the Japanese government. The apparatus was a pointer (dial, ABC) telegraph that included a Japanese character dial. Some officers in the government learned how to operate it with the help of the Prussian delegation. The apparatus was analyzed by a team from the government. This telegraph was demonstrated to the Shogun in 1866. Since the dial telegraph developed by Siemens & Halske was popular in Prussia, the gifted apparatus may have been its version localized for Japan. However, the details about this apparatus are unfortunately unknown.

Studies by domestic governments

While the technology became known owing to the demonstrations, several domestic governments launched their own research initiatives into the telegraph. One of those researchers was Kisuke Nakamura, a chemist and who was particularly skilled in understanding technical drawings. He played a central role in the development of the telegraph in Japan. He and his colleagues created their own first telegraph probably no later than 1857. This could be the first operative telegraph manufactured by Japanese engineers. One of Nakamura's apparatuses still survives today. It resides in the Isahaya Museum of Art & History in Nagasaki. The box that stores the apparatus contains its name "wijzer telegraaf" in Katakana characters. "Wijzer telegraaf" is a Dutch term that means pointer (or dial- or ABC-) telegraph. The year 1862 and Nakamura's name are also written on the box. The apparatus comprises a transmitter and a receiver, each of which holds a Japanese Katakana dial, as shown in the figure on the next page (image courtesy of Isahaya City).

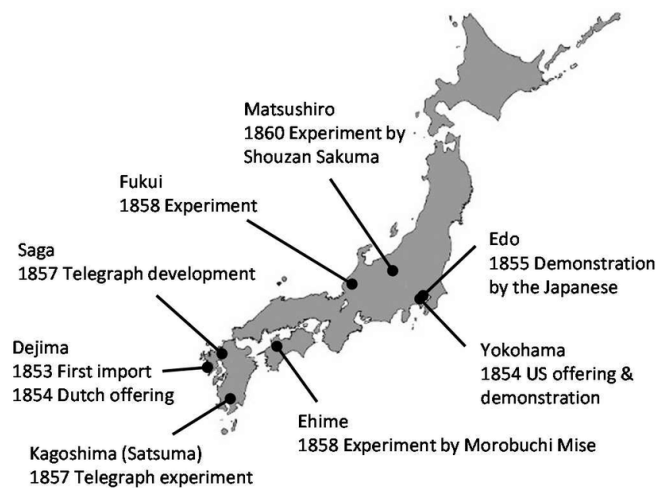


(a)

(b)

To me it is evident that this design is based upon the dial telegraph by prof. Charles Wheatstone from 1840-1842 (see a description in my chapter on 'Cooke & Wheatstone').

Locations of important events associated with early Japanese telecommunication technologies.



Addendum

1869 Start of Telegram Service (Founding of Telegraph in Japan)



On Dec. 25 of the second year of the Meiji Period (1869), a [telegraph service was started](#) between Tokyo and Yokohama. The telegraph apparatus used at that time was called the Breguet letter-point telegraph, and was operated by moving a handle over a disc on which letters were written. This telegraph, unlike the print telegraph that used codes, was operated by pointing to letters on the disc, and was easy for novices to work. The foreign expert then was an Englishman named [G. M. Gilbert](#). In those days, many [hired foreigners](#) like him were invited to Japan to introduce the Western system and technology.

PART 2: THE MORSE CODE FOR JAPANESE CHARACTERS [1] [2]

Since the Morse telegraph was invented by an American, its coding method was designed for European alphabets. Thus, a different coding method was required to represent Japanese characters for this type of telegraph to spread throughout Japan.

Therefore, the Dutch staff localized the Morse code so as to allow for Japanese characters to be encoded. One of the features of the Japanese language is that it uses two different types of characters: *Kana*, which is a phonogram, and *Kanji*, which is an ideogram imported from ancient China. Sentences are constructed by combining these two types of characters.

The number of Kanji characters amounts to thousands. Thus, it was impractical to be managed by the Morse code. However, Kana has only 48 characters. Although it is further divided into *Katakana* and *Hiragana*, one can be substituted for the other. Thus, it was reasonable for the Dutch to provide the codes for Katakana characters. The figure below shows a part of the code offered by the Dutch. In the history of information technology, this is the very first code for Japanese characters. The word length was determined without considering the frequency of each character. Therefore, this code did not utilize the advantages of short transmission time, which should be obtained by variable length code. This was nevertheless unavoidable because nobody had ever inspected a statistic of the character frequency in Japanese texts by 1854.

Katakana	Character	Code Word
イ	(i)	-
ロ	(ro)	--
ハ	(ha)	---
ニ	(ni)	--- -
...
ン	(n)	--- --- ---

The first Japanese Morse code offered by the Dutch in 1854

Japanese Alphabet (Katakana Symbols)						
ア a	エ e	イ i	オ o	ウ u		
カ ka	キ ki	ク ku	ケ ke	コ ko	サ sa	シ shi
ス su	セ se	ソ so	タ ta	チ chi	ツ tsu	テ te
ト to	ナ na	ニ ni	ヌ nu	ネ ne	ノ no	ハ ha
ヒ hi	フ fu	ヘ he	ホ ho	ヤ ya	ユ yu	ヨ yo
マ ma	ミ mi	ム mu	メ me	モ o	ラ ra	リ ri
ル ru	レ re	ロ ro	ワ wa	ヲ wo	ン n	

I'm going to expand a bit here, but of course it's not at all my intention to teach you the use of Morse code in Japanese. Consider what follows as an illustration of a few more "modern" methods. Japanese Morsecode is used on the landline telegraph system of Japan and by Japanese ship and fixed radio stations. However, when messages are sent to foreign countries or ships they are transmitted by International Morse.

>>What follows is taken out of the pamphlet 'Code of the world', published by the 'Society of Wireless Pioneers' in 1979

THE KATA KANA CODE OF THE JAPANESE

The Kata Kana Code commonly referred to as simply "Kana" is the code used by the Japanese in radio and telegraphic communication. It is based on what is known as Romaji, a form in which an abbreviated Japanese alphabet appears phonetically in English - as for instance, Sayonara (goodbye). This word consists of 4 letters, SA YO NA RA, and is written on Japanese typewriters by 4 keys.

The Romaji alphabet uses all English vowels and the one consonant (N) as complete individual characters. With a few exceptions which will be noted later, other Romaji characters consist of a consonant followed by a vowel, in some cases followed by one of two modifiers known as the Nagori and the Hanagori, also explained later. The Japanese typewriters use the Hiragana characters and the Japanese operators who become proficient on the mill use it instead of the brush or pencil. Hiragana is a sort of shorthand language.

Actually, there are four forms of writing Japanese, ie: 1. Kanji characters derived from Chinese, 2. Katakana or "stiff hand", 3. Hiragana, the cursive form and 4. Romaji, the English rendition of the Japanese character. A combination of the first with either the second or third can be used as, for example, tomodachi (friend): Katakana hiragana but katakana should not be mixed with hiragana.

Kanji is of Chinese origin and comprises some 1812 characters, each usually representing an entire word or idea, whereas Katakana and Hiragana are Japanese and in reality syllabarys. Katakana is used as a rule for all foreign phrases and words. All messages presented in Japan for transmission are presented in Katakana - at least by the Japanese.

Basically Japanese is one of the world's simplest languages to pronounce. All 5 basic vowel sounds are without variation. They are pronounced as in Italian, Spanish or other "Romance" Languages. The hard sounds and semi-hard sounds are characterized by a small mark written to the top right by two small short lines ("). A small circle indicates a semi-hard sound (°). When Xmtg CW., the addition of two dots sent as a separate letter indicates the preceding letter or syllable is hard and consequently two short lines are added to it.

add: (Honogori • •)
 (Negori • • — — •)

In the code table below, the table at left is *Romaji*, centre is the code groups and at right is *Hiragana* characters. (Compare with the table on page 6)

Kata Kana Radio Code		
A ----	P	あ
I --	イ	い
U ...	ウ	う
E ----	エ	え
O	オ	お
N	ン	ん
KA	カ	か
KI	キ	き
KU	ク	く
KE ---	ケ	け
KO ----	コ	こ
SA	サ	さ
SHI	ツ	し
SU	ス	す
SE	セ	せ
SO	ソ	そ
TA --	タ	た
CHI	チ	ち
TSU	ツ	つ
TE	テ	て
TO	ト	と
NA ...	ナ	な
NI	ニ	に
NU	ヌ	ぬ
NE ----	ネ	ね
NO	ノ	の
HA	ハ	は
HI	ヒ	ひ
FU	フ	ふ
HE .	ヘ	へ
HO ---	ホ	ほ
MA	マ	ま
MI	ミ	み
MU -	ム	む
ME	メ	め
MO	モ	も
YA ...	ヤ	や
(Y)I --	イ	い
YU	ユ	ゆ
(Y)E	エ	え
YO --	ヨ	よ
RA ...	ラ	ら
RI ---	リ	り
RU	ル	る
RE ---	レ	れ
RO	ロ	ろ
WA ---	ワ	わ
(W)I	ヰ	お
(W)U ...	ヱ	う
(W)E	ヰ	え
(W)O ---	ヲ	お

FIGURES: For the numbers 1 to 10 inclusive there are two sets of words, the code signals being the same as in English. The characters for the figures are the same as those used by the Chinese therefore by learning the characters one can read price tags in both China and Japan although, of course, the Chinese give them different names.

1	ichi	hitotsu	一
2	ni	futatsu	二
3	san	mitsu	三
4	shi	yoku	四
5	go	itsutsu	五
6	roku	mutsu	六
7	shichi	nanatsu	七
8	hachi	yatsu	八
9	ku	kokonotsu	九
10	ju	to	十

Above 10 there is only one set: ichi, ni, san, etc., and 11 therefore becomes ju, ichi; then ju ni, ju san, etc.

Hundred (hyaku) 百

Thousand (sen) 千

Examples of writing numbers:

15 十五

27 二十七

238 二百三十八

496 四百九十六

THE WABUN CODE

CW (Continuous Wave) Wire radio wave]

The *Wabun* code is a form of Morse code used to send Japanese language in *kana* characters. Unlike International Morse Code, which represents letters of the Latin script, in Wabun each symbol represents a Japanese kana. For this reason, Wabun code is also sometimes called Kana code.

When Wabun Code is intermixed with International Morse code, the prosign DO is used to announce the beginning of Wabun, and the prosign SN is used to announce the return to International Code.

(Procedure signs or prosigns are shorthand signals used in Morse code radio telegraphy procedures, for the purpose of simplifying and standardizing communications related to radio operating issues among two or more radio operators. They are distinct from general Morse code abbreviations, which consist mainly of brevity codes that convey messages to other parties with greater speed and accuracy.)

Wabun starts by — — — — —

End of Wabun is - - - - -

Morse Codes モールスコード			
A イ	Q レ	エ	?
ロ	ソ	テ	°
B ハ	P ツ	ア	
C ニ	Q ネ	サ	
D ホ	R ナ	キ	
E ヘ	S ラ	ユ	
ト	T ム	= メ	
F チ	U ウ	ミ	1 一
G リ	キ	シ	2 二
H ヌ	ノ	エ	3 三
I *	オ	ヒ	4 四
ル	V ク	モ	5 五
J ヲ	W ヤ	セ	6 六
K ワ	X マ	ス	7 七
L カ	Y ケ	+ ン	8 八
M ヨ	Z フ	・ 、	9 九
N タ	コ	」	0 〇

More via:

https://en.wikipedia.org/wiki/Wabun_code

<http://www.asahi-net.or.jp/~rg8k-okt/ecw.htm>

<http://www.rfcafe.com/references/qst/japanese-morse-telegraph-code-sep-1942-qst.htm>

MAIN REFERENCES

[1] I have extracted (much shortened and added two photos) the above from an excellent presentation by Mr. Satoru Ohta from the Department of Information System Engineering, Prefectural University, Toyama, Japan, in August 2017 at the 2017 IEEE HISTory of ELectrotechnolgy CONFerence (HISTELCON) [DOI: 10.1109/ HISTELCON .2017.8535723]. Mr.Ohta would like to thank Postal Museum Japan, Isahaya City, and Shizuoka Prefectural Central Library granting the permission to use images.

https://www.researchgate.net/publication/319048224_The_Earliest_Japanese_Telecommunication_Technology

https://en.wikipedia.org/wiki/Wabun_code

[2] CODES OF THE WORLD

https://archive.org/details/morse_codes_of_the_world/mode/2up

By 'Society of Wireless Pioneers' 1979

[3] WIKIPEDIA and GOOGLE: see within the text.

